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U.S. Aerospace Industry Librarians and Technical Information Specialists as Information Intermediaries: Results of the Phase 2 Survey

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U.S. AEROSPACE INDUSTRY LIBRARIANS AND TECHNICAL INFORMATION SPECIALISTS AS INFORMATION INTERMEDIARIES: RESULTS OF THE PHASE 2 SURVEY

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ABSTRACT

The U.S. government technical report is a primary means by which the results of federally funded research and development (R&D) are transferred to the U.S. aerospace industry. However, little is known about this information product in terms of its actual use, importance, and value in the transfer of federally funded R&D. Little is also known about the intermediary-based system that is used to transfer the results of federally funded R&D to the U.S. aerospace industry. To help establish a body of knowledge, the U.S. government technical report is being investigated as part of the *NASA/DoD Aerospace Knowledge Diffusion Research Project.* In this report, we summarize the literature on technical reports, present a model that depicts the transfer of federally funded aerospace R&D via the U.S. government technical report, and present the results of research that investigated aerospace knowledge diffusion vis-à-vis U.S. aerospace industry librarians and technical information specialists as information intermediaries.

INTRODUCTION

NASA and the DoD maintain scientific and technical information (STI) systems for acquiring, processing, announcing, publishing, and transferring the results of government-performed and government-sponsored research. Within both the NASA and DoD STI systems, the U.S. government technical report is considered a primary mechanism for transferring the results of this research to the U.S. aerospace community. However, McClure (1988) concludes that we actually know little about the role, importance, and impact of the technical report in the transfer of federally funded R&D because little empirical information about this product is available. The NASA and DoD STI systems are intermediary-based systems that rely on librarians and technical information specialists to complete the knowledge transfer process. To date, empirical findings on the effectiveness of information intermediaries and the role(s) they play in knowledge transfer are sparse and inconclusive (Beyer and Trice, 1982).

We are examining the system(s) used to diffuse the results of federally funded aerospace R&D as part of the *NASA/DoD Aerospace Knowledge Diffusion Research Project.* This project investigates, among other things, the information-seeking behavior of U.S. aerospace engineers and scientists and the role of academic- and industry-affiliated information intermediaries in the aerospace knowledge diffusion process (Pinelli, Kennedy, and Barclay, 1991; Pinelli, Kennedy, Barclay, and White, 1991). The results of this investigation could (1) advance the development of practical theory, (2) contribute to the design and development of aerospace information systems, and (3) have practical implications for transferring the results of federally funded aerospace R&D to the U.S. aerospace community. The project fact sheet is Appendix A.

In this report, we summarize the literature on technical reports, provide a model that depicts the transfer of federally funded aerospace R&D through the U.S. government technical report, and present the results of a survey of U.S. aerospace industry libraries, librarians, and technical information specialists. We summarize the findings of the survey and close with some thoughts regarding the role of U.S. aerospace industry librarians and technical information in the aerospace knowledge diffusion process.

THE U.S. GOVERNMENT TECHNICAL REPORT

Although they have the potential for increasing technological innovation, productivity, and economic competitiveness, U.S. government technical reports may not be utilized because of limitations in the existing transfer mechanism. According to Ballard, et al., (1986), the current system "virtually guarantees that much of the Federal investment in creating STI will not be paid back in terms of tangible products and innovations." They further state that "a more active and coordinated role in STI transfer is needed at the Federal level if technical reports are to be better utilized."

Characteristics of Technical Reports

The definition of the technical report varies because the report serves different roles in communication within and between organizations. The technical report has been defined etymologically, according to report content and method (U.S. Department of Defense, 1964); behaviorally, according to the influence on the reader (Ronco, et al., 1964); and rhetorically, according to the function of the report within a system for communicating STI (Mathes and Stevenson, 1976). The boundaries of technical report literature are difficult to establish because of wide variations in the content, purpose, and audience being addressed. The nature of the report -- whether it is informative, analytical, or assertive -- contributes to the difficulty.

Fry (1953) points out that technical reports are heterogenous, appearing in many shapes, sizes, layouts, and bindings. According to Smith (1981), "Their formats vary; they might be brief (two pages) or lengthy (500 pages). They appear as microfiche, computer printouts or vugraphs, and often they are loose leaf (with periodic changes that need to be inserted) or have a paper cover, and often contain foldouts. They slump on the shelf, their staples or prong fasteners snag other documents on the shelf, and they are not neat."

Technical reports may exhibit some or all of the following characteristics (Gibb and Phillips, 1979; Subramanyam, 1981):

- Publication is not through the publishing trade.
- Readership/audience is usually limited.
- Distribution may be limited or restricted.

- Content may include statistical data, catalogs, directions, design criteria, conference papers and proceedings, literature reviews, or bibliographies.

- Publication may involve a variety of printing and binding methods.

The SATCOM report (National Academy of Sciences - National Academy of Engineering, 1969) lists the following characteristics of the technical report:

- It is written for an individual or organization that has the right to require such reports.

- It is basically a stewardship report to some agency that has funded the research being reported.

- It permits prompt dissemination of data results on a typically flexible distribution basis.

- It can convey the total research story, including exhaustive exposition, detailed tables, ample illustrations, and full discussion of unsuccessful approaches.

History and Growth of the U.S. Government Technical Report

The development of the [U.S. government] technical report as a major means of communicating the results of R&D, according to Godfrey and Redman (1973), dates back to 1941 and the establishment of the U.S. Office of Scientific Research and Development (OSRD). Further, the growth of the U.S. government technical report coincides with the expanding role of the Federal government in science and technology during the post World War II era. However, U.S. government technical reports have existed for several decades. The Bureau of Mines *Reports of Investigation* (Redman, 1965/66), the *Professional Papers of the United States Geological Survey*, and the *Technological Papers of the National Bureau of Standards* (Auger, 1975) are early examples of U.S. government technical reports. Perhaps the first U.S. government publications officially created to document the results of federally funded (U.S.) R&D were the technical reports first published by the National Advisory Committee for Aeronautics (NACA) in 1917.

Auger (1975) states that "the history of technical report literature in the U.S. coincides almost entirely with the development of aeronautics, the aviation industry, and the creation of the NACA, which issued its first report in 1917." In her study, *Information Transfer in Engineering*, Shuchman (1981) reports that 75 percent of the engineers she surveyed used technical reports; that technical reports were important to engineers doing applied work; and that aerospace engineers, more than any other group of engineers, referred to technical reports. However, in many of these studies, including Shuchman's, it is often unclear whether U.S. government technical reports, non-U.S. government technical reports, or both are included.

The U.S. government technical report is a primary means by which the results of federally funded R&D are made available to the scientific community and are added to the literature of

science and technology (President's Special Assistant for Science and Technology, 1962). McClure (1988) points out that "although the [U.S.] government technical report has been variously reviewed, compared, and contrasted, there is no real knowledge base regarding the role, production, use, and importance [of this information product] in terms of accomplishing this task." Our analysis of the literature supports the following conclusions reached by McClure:

- The body of available knowledge is simply inadequate and noncomparable to determine the role that the U.S. government technical report plays in transferring the results of federally funded R&D.

- Further, most of the available knowledge is largely anecdotal, limited in scope and dated, and unfocused in the sense that it lacks a conceptual framework.

- The available knowledge does not lend itself to developing "normalized" answers to questions regarding U.S. government technical reports.

THE TRANSFER OF FEDERALLY FUNDED AEROSPACE R&D AND THE U.S. GOVERNMENT TECHNICAL REPORT

Three paradigms -- appropriability, dissemination, and diffusion -- have dominated the transfer of federally funded (U.S.) R&D (Ballard, et al., 1989; Williams and Gibson, 1990). Whereas variations of them have been tried within different agencies, overall Federal (U.S.) STI transfer activities continue to be driven by a "supply-side," dissemination model.

The Appropriability Model

The **appropriability model** emphasizes the production of knowledge by the Federal government that would not otherwise be produced by the private sector and competitive market pressures to promote the use of that knowledge. This model emphasizes the production of basic research as the driving force behind technological development and economic growth and assumes that the Federal provision of R&D will be rapidly assimilated by the private sector. Deliberate transfer mechanisms and intervention by information intermediaries are viewed as unnecessary. Appropriability stresses the supply (production) of knowledge in sufficient quantity to attract potential users. Good technologies, according to this model, sell themselves and offer clear policy recommendations regarding Federal priorities for improving technological development and economic growth. This model incorrectly assumes that the results of federally funded R&D will be acquired and used by the private sector, ignores the fact that most basic research is irrelevant to technological innovation, and dismisses the process of technological innovation within the firm.

The Dissemination Model

The **dissemination model** emphasizes the need to transfer information to potential users and embraces the belief that the production of quality knowledge is not sufficient to ensure its fullest

use. Linkage mechanisms, such as information intermediaries, are needed to identify useful knowledge and to transfer it to potential users. This model assumes that if these mechanisms are available to link potential users with knowledge producers, then better opportunities exist for users to determine what knowledge is available, acquire it, and apply it to their needs. The strength of this model rests on the recognition that STI transfer and use are critical elements of the process of technological innovation. Its weakness lies in the fact that it is passive, for it does not take users into consideration except when they enter the system and request assistance. The **dissemination model** employs one-way, source-to-user transfer procedures that are seldom responsive in the user context. User requirements are seldom known or considered in the design of information products and services.

The Knowledge Diffusion Model

The **knowledge diffusion model** is grounded in theory and practice associated with the diffusion of innovation and planned change research and the clinical models of social research and mental health. Knowledge diffusion emphasizes "active" intervention as opposed to dissemination and access; stresses intervention and reliance on interpersonal communications as a means of identifying and removing interpersonal barriers between users and producers; and assumes that knowledge production, transfer, and use are equally important components of the R&D process. This approach also emphasizes the link between producers, transfer agents, and users and seeks to develop user-oriented mechanisms (e.g., products and services) specifically tailored to the needs and circumstances of the user. It makes the assumption that the results of federally funded R&D will be under utilized unless they are relevant to users and ongoing relationships are developed among users and producers. The problem with the knowledge diffusion model is that (1) it requires a large Federal role and presence and (2) it runs contrary to the dominant assumptions of established Federal R&D policy. Although U.S. technology policy relies on a "dissemination-oriented" approach to STI transfer, other industrialized nations, such as Germany and Japan, are adopting "diffusion-oriented" policies which increase the power to absorb and employ new technologies productively (Branscomb, 1991; Branscomb, 1992).

The Transfer of (U.S.) Federally-Funded Aerospace R&D

A model depicting the transfer of federally funded aerospace R&D through the U.S. government technical report appears in figure 1. The model is composed of two parts -- the **informal** that relies on collegial contacts and the **formal** that relies on surrogates, information producers, and information intermediaries to complete the "producer to user" transfer process.

When U.S. government (i.e., NASA) technical reports are published, the initial or primary distribution is made to libraries and technical information centers. Copies are sent to surrogates for secondary and subsequent distribution. A limited number of copies are set aside to be used by the author for the "scientist-to-scientist" exchange of information at the collegial level.

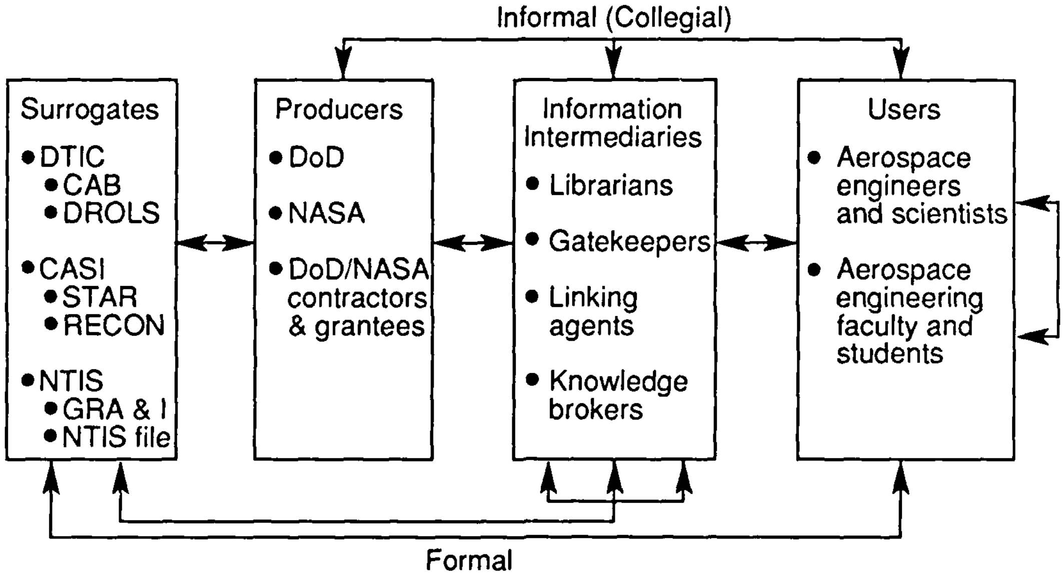

Figure 1. The U.S. Government Technical Report in
a Model Depicting the Dissemination of Federally Funded Aerospace R&D.

Surrogates serve as technical report repositories or clearinghouses for the producers and include the Defense Technical Information Center (DTIC), the NASA Center for Aero Space Information (CASI), and the National Technical Information Service (NTIS). These surrogates have created a variety of technical report announcement journals such as *CAB* (Current Awareness Bibliographies), *STAR* (Scientific and Technical Aerospace Reports), and *GRA&I* (Government Reports Announcement and Index) and computerized retrieval systems such as *DROLS* (Defense RDT&E Online System), *RECON* (REsearch CONnection), and NTIS *On-line* that permit online access to technical report data bases. Information intermediaries are, in large part, librarians and technical information specialists in academia, government, and industry. Those representing the producers serve as what McGowan and Loveless (1981) describe as "knowledge brokers" or "linking agents." Information intermediaries connected with users act, according to Allen (1977), as "technological entrepreneurs" or "gatekeepers." The more "active" the intermediary, the more effective the transfer process becomes (Goldhor and Lund, 1983). Active intermediaries move information from the producer to the user, often utilizing inter personal (i.e., face-to-face) communication in the process. Passive information intermediaries, on the other hand, "simply array information for the taking, relying on the initiative of the user to request or search out the information that may be needed" (Eveland, 1987).

The overall problem with the total Federal STI system is that "the present system for transferring the results of federally funded STI is passive, fragmented, and unfocused;" effective knowledge transfer is hindered by the fact that the Federal government "has no coherent of systematically designed approach to transferring the results of federally funded R&D to the user" (Ballard, et al., 1986). In their study of issues and options in Federal STI, Bikson and her colleagues (1984) found that many of the interviewees believed "dissemination activities were afterthoughts, undertaken without serious commitment by Federal agencies whose primary

concerns were with [knowledge] production and not with knowledge transfer;" therefore, "much of what has been learned about [STI] and knowledge transfer has not been incorporated into federally supported information transfer activities."

Problematic to the **informal** part of the system is that knowledge users can learn from collegial contacts only what those contacts happen to know. Ample evidence supports the claim that no one researcher can know about or keep up with all the research in his/her area(s) of interest. Like other members of the scientific community, aerospace engineers and scientists are faced with the problem of too much information to know about, to keep up with, and to screen. Further, information is becoming more interdisciplinary in nature and more international in scope.

Two problems exist with the **formal** part of the system. First, the **formal** part of the system employs one-way, source-to-user transmission. The problem with this kind of transmission is that such formal one-way, "supply side" transfer procedures do not seem to be responsive to the user context (Bikson, et al., 1984). Rather, these efforts appear to start with an information system into which the users' requirements are retrofit (Adam, 1975). The consensus of the findings from the empirical research is that interactive, two-way communications are required for effective information transfer (Bikson, et al., 1984).

Second, the **formal** part relies heavily on information intermediaries to complete the knowledge transfer process. However, a strong methodological base for measuring or assessing the effectiveness of the information intermediary is lacking (Beyer and Trice, 1982). In addition, empirical data on the effectiveness of information intermediaries and the role(s) they play in knowledge transfer are sparse and inconclusive. The impact of information intermediaries is likely to be strongly conditional and limited to a specific institutional context.

According to Roberts and Frohman (1978), most Federal approaches to knowledge utilization have been ineffective in stimulating the diffusion of technological innovation. They claim that the numerous Federal STI programs are "highest in frequency and expense yet lowest in impact" and that Federal "information dissemination activities have led to little documented knowledge utilization." Roberts and Frohman also note that "governmental programs start to encourage utilization of knowledge only after the R&D results have been generated" rather than during the idea development phase of the innovation process. David (1986), Mowery (1983), and Mowery and Rosenberg (1979) conclude that successful [Federal] technological innovation rests more with the transfer and utilization of knowledge than with its production.

THE INFORMATION INTERMEDIARY AND AEROSPACE KNOWLEDGE DIFFUSION

The formal part of the aerospace knowledge transfer mechanism relies on producer surrogates, information products, and information intermediaries to complete the producer-to-user transfer process. Although information intermediaries play a significant role in the diffusion of this knowledge, their contributions to the knowledge diffusion infrastructure are poorly understood. Furthermore, a strong methodological base for measuring or assessing the effectiveness

of the information intermediary is lacking. Empirical findings on the effectiveness of information intermediaries are sparse and inconclusive (Kitchen, March 1989).

The related literature produced some noteworthy findings. In her review, Auster (1990) viewed the librarian as an intermediary in the information transfer process. In her approach, the information transfer process consists of a resource, a user, and a mode of access that links the two together. In their review, Drenth, Morris, and Tseng (1991) looked at expert systems as information intermediaries. The review of environmental scanning by Choo and Auster (1993) provides useful background regarding organizational information use and intermediaries. Similarly, the review of information gatekeepers by Metoyer-Duran (1993) provides useful information regarding the role(s) of human gatekeepers in the information transfer process. King and his colleagues (1984), using a value added approach, investigated the contributions that information intermediaries and libraries make to the value of DoE information.

RESULTS OF THE PHASE 2 SURVEY

A list of U.S. and Canadian aerospace libraries served as the population for the Phase 2 survey. This list was compiled from several sources, including the *Directory of Special Libraries and Information Centers* and the Special Libraries Association. To be eligible for participation in the study, each industry library had to hold aerospace, aeronautical, or related collections. The completed list consisted of 336 libraries; all 336 libraries were surveyed. With an adjusted sample of 271 and 182 completed questionnaires, the adjusted response rate was 67 percent. The survey was conducted between May and August 1990.

A group of special librarians worked with the project team to compile the list of survey questions. The questions were pretested before distribution. The questionnaire, which is Appendix B, was organized around the following topical objectives: library demographics, NASA technical reports, bibliographic tools and electronic data bases, information technology, NASA information products and services, end-user-intermediary interface, library outreach, and producer-intermediary interface. Data are presented for each of the topical objectives.

Demographics

The following **librarian composite participant profile** was based on Phase 2 survey demographic data which appear in table 1: is female (70.6%), has about 17 years of library/information experience, has about 9 years of professional experience in her present position, holds an MLS (70.3%), belongs to a professional national library/information society (80.8%), does not belong to a professional national technical society (51.1%), and is not a manager (77.0%).

The following **library composite profile** was based on Phase 2 survey demographic data appearing in table 2: is the sole or only library, serves less than half (46.5%) of the potential user population, has about 7 professional staff members, and operates as a cost center. (See Tweed, 1984 for a definition of cost center.)

Table 1. U.S. Aerospace Industry Librarian Survey Demographics
[N = 182]

Demographics	Percentage	Number
Gender		
Female	70.6	125
Male	29.4	52
Years of library/information experience		
1 to 10	22.7	40
11 to 20	48.5	86
21 to 30	21.5	38
31 to 40+	6.4	11
Mean = 17.2 years Median = 17.0 years		
Years in present position		
1 to 10	71.6	127
11 to 20	19.4	34
21 to 30	7.3	13
31 to 40+	1.2	2
Mean = 9.1 years Median = 7.0 years		
Education Level		
BA/BS	11.5	21
MLS	70.3	128
Other Master's Degree	9.9	18
Ph.D.	3.3	6
Other	5.0	9
Professional National Library/Information Membership		
No	19.2	35
Yes	80.8	147
ALA	23.6	43
ASEE	2.8	5
ASIS	10.4	19
SLA	57.7	105
Other	14.3	26
Professional National Technical Membership		
No	51.1	93
Yes	48.9	89
ACM	3.9	7
AIAA	3.9	7
ASTM	4.4	8
IEEE	8.2	15
Other	10.4	19
Title		
Manager	18.7	34
Nonmanager	77.0	140

Table 2. U.S. Aerospace Industry Library Demographics

Demographics	Percentage	Number
Are There Other Libraries At Your Facility	35.1	61
How Many		
0	13.6	8
1	28.8	17
2	23.7	14
3 - 6	22.1	13
7 or More	11.9	7
	Mean	
Number Of Potential Library Users	3,603.0	125
Percentage Of Potential Users Who Use The Library	46.5	112
Staff	Mean (Median)	
Administration/Management	3.4 (1.0)	111
Librarians/Technical Information Specialists	7.1 (2.0)	137
Library Technicians	7.9 (2.0)	110
Clerks	5.6 (2.0)	102
Other	6.0 (2.0)	28
Classification		
True Profit Center	1.2	2
Protected Profit Center	3.5	6
Cost Center	70.2	120
Self-Sufficient	8.2	14
Cost-Justified Center	7.6	13
Other	9.4	16

Technical Reports

Survey participants were asked about their libraries' collection of domestic and foreign technical reports (tables 3 and 4). About 81% of the libraries had a NASA technical report collection; 73.5% had DoD technical reports; 63.8% had AGARD technical reports; and 62.4% had AIAA papers (table 3). More than 50 percent of the participants' libraries also had collections of U.S. aerospace company reports (60%), U.S. university technical reports (58.9%), and FAA technical reports (50.3%). For the most part, the domestic technical reports were held as paper products as opposed to microfiche.

Few of the U.S. aerospace libraries had foreign technical report collections (table 4). Slightly less than one-third of the libraries held British and ESA technical reports. About 20 percent of the industry libraries had collections of German technical reports.

Table 3. Technical Reports in U.S. Aerospace Industry Libraries -- Domestic Holdings

Holdings	Paper	Fiche
	% (n)	% (n)
AGARD Technical Reports	63.8 (102)	45.6 (67)
AIAA Papers	62.4 (103)	32.0 (47)
DoD Technical Reports	73.5 (122)	57.6 (91)
FAA Technical Reports	50.3 (80)	30.8 (44)
NASA Technical Reports	80.8 (143)	67.5 (108)
U.S. Aerospace Company Technical Reports	60.0 (99)	-----
U.S. University Technical Reports	58.9 (93)	-----

Table 4. Technical Reports in U.S. Aerospace Industry Libraries -- Foreign Holdings

Holdings	Percentage	Number
British ARC/RAE Technical Reports	30.5	51
ESA Technical Reports	32.1	53
French ONERA Technical Reports	13.1	21
German DFVLR, DLR, and MBB Technical Reports	20.4	33
Japanese NAI Technical Reports	6.4	10
Swedish NAL Technical Reports	6.0	9
Other	3.3	6

NASA Technical Reports. Of the industry libraries that held a collection of NASA technical reports, 33.5% indicated they obtained these technical reports directly from NASA and about 33% indicated they obtained NASA technical reports from NTIS (table 5). About 15% indicated they received NASA technical reports from the GPO; about 11% indicated that they do not routinely receive NASA technical reports.

NACA/NASA Technical Report Use. Use of NACA and NASA technical reports was measured on a 1 to 5 point scale with "1" being heavily used and "5" being no use (table 6). About 8% indicated that NACA technical reports were heavily used. About 30% of the libraries

surveyed indicated that NASA technical reports were heavily used.

Table 5. How U.S. Aerospace Industry Libraries
Acquire NASA Technical Reports

Source	Percentage	Number
Directly From NASA	33.5	59
From NTIS	33.0	58
From GPO	15.3	27
Other	6.8	12
Do Not Routinely Receive NASA Technical Reports	11.4	20

Table 6. Use of NACA and NASA Technical Reports
in U.S. Aerospace Industry Libraries

Item	Percentage*	Do Not Know	No NACA/NASA Technical Report Collection
NACA Technical Reports	7.7	7.1	24.7
NASA Technical Reports	30.8	2.7	8.2

* The percentages reported combined "1" and "2" responses on a 5-point scale with "1" being "heavily" used.

Access. Survey participants were asked a series of questions regarding access to NASA technical reports (table 7). Most libraries provided a variety of access mechanisms including printed directories such as NASA *STAR* (87.7%), the card catalog (67.2%), and NASA *RECON* (61.5%). Bibliographic access was provided by title (92.3%), report number (91.1%), subject (90.1%), and author (89%). Physical access to NASA technical reports was open (76.4%). About 86% of the NASA technical reports were arranged by report number and series and 68% of NASA technical reports were individually cataloged.

How Obtained. Survey participants were asked how they obtained copies of NASA technical reports during the past 6 months (table 8). About 31% of the libraries obtain NASA technical reports from NTIS and 20% obtain them from DTIC. About 15% obtain them from another library, presumably through interlibrary loan (ILL). About 12% obtain them from NASA STIF (now the Center for Aero Space Information -- CASI) and about 10% obtain them from the AIAA technical library. NASA authors and NASA field centers are seldom used to obtain copies of NASA reports. The median numbers indicate that some of these sources were not used to obtain copies of NASA technical reports during the 6-month period.

Table 7. How U.S. Aerospace Industry Libraries Provide Access to NASA Technical Reports

Access	Percentage	Number
Mechanism		
Card Catalog	67.2	80
Printed Directories (e.g. NASA *STAR*)	87.7	121
OPAC (Online Public Access Catalog)	56.3	58
COMCAT (Computer Output Microfiche Catalog)	15.3	13
NASA *RECON*	61.5	64
Bibliographic Access		
Author	89.0	129
Title	92.3	131
Report Number	91.1	133
Subject	90.1	128
Corporate Source	79.4	104
Contract/Grant Number	68.8	86
Key Words	76.2	93
Other	10.1	17
Physical Access		
Open	76.4	97
Closed	48.1	50
Individually Cataloged	68.1	79
Arranged By Report Numbers and Report Series	86.2	112
Other	10.7	18

Table 8. Sources Used By U.S. Aerospace Industry Libraries To Obtain NASA Technical Reports

Source	Mean (Median) Number of Times Source Used in Past 6 Months	Number	Don't Know
NTIS	31.3 (10.0)	102	22
NASA STIF	11.9 (0.0)	82	17
DTIC	20.0 (1.0)	85	24
NASA Field Center Library	3.1 (0.0)	78	19
NASA Author	1.2 (0.0)	75	18
Another Library	15.1 (1.0)	84	20
DDS or Broker	0.2 (0.0)	70	17
OCLC	1.6 (0.0)	77	17
AIAA Technical Library	9.3 (0.0)	80	16
Other	1.7 (0.0)	19	--

Reasons NASA Reports Could Not Be Obtained. Survey participants were asked if a NASA technical report had been requested by a patron but could not be obtained from their library for a specific reason. Survey participants were asked to identify that reason(s) (table 9). The "library did not own the report" was the most frequently selected reason ($\bar{X}$ = 30.6) followed by the "report was in a *STAR* category not received by the library" ($\bar{X}$ = 10.0).

Table 9. Reasons NASA Technical Reports Could Not Be Obtained By U.S. Aerospace Industry Librarians

Source	Mean (Median) Number of Times Reason Occurred in Past 6 Months	Number	Do Not Know
Library Did Not Own Report	**30.6 (6.0)**	**95**	40
Library Owned Report But It Was Missing or Could Not Be Found	3.0 (0.0)	77	39
Report Was In A *STAR* Category Not Received By Library	**10.0 (0.0)**	**66**	45
Report Was Distributed In Fiche Only And Library Receives Paper Copy In That *STAR* Category	0.2 (0.0)	58	44
Report Was Distributed In Paper Only And Library Receives Fiche Copy In That *STAR* Category	0.4 (0.0)	60	44
Report Was Listed In *STAR* But Was Not Automatically Distributed By NASA	3.8 (0.0)	64	46
Report Was In a *STAR* Category You Automatically Receive But You Never Received It	0.7 (0.0)	57	47
Report Was Referenced As a NASA Publication But Was Not In The NASA System	3.0 (0.0)	67	43
Report Was Classified, Restricted, Or Limited Distribution Document	3.6 (2.0)	74	41
Report Was Available Only From NASA Center of Origin	1.6 (0.0)	65	7
Report Was Available Only From Author Or Technical Monitor	0.6 (0.0)	59	50
Insufficient Bibliographic Information; Did Not Know Where Or How To Obtain Report	1.4 (0.0)	71	37
Other	12.6 (0.0)	12	--

<u>Reasons Libraries Would Discontinue Receipt of NASA Reports</u>. Survey participants were asked why they would consider discontinuing automatically receiving NASA technical reports (table 10). Three reasons predominate: (1) subscription cost (64.1%), physical storage space (61.3%), and "not all NASA technical reports were useful" (54.5%). About 55% of the survey participants indicated they did not automatically receive NASA technical reports.

Table 10. Reasons U.S. Aerospace Industry Librarians Would Consider Discontinuing Receipt of NASA Technical Reports

Reason	Percentage	Number
Automatic Distribution (Subscription) Too Costly	**64.1**	66
NASA Technical Reports Duplicate Other Sources of Needed Information	12.5	11
Information Contained in NASA Technical Reports Is Not Timely	8.9	8
Not All Reports Received Were Useful	**54.5**	55
Problems With Distribution and Receipt Of NASA Technical Reports	19.8	17
NASA Contract/Grant Completed; No Longer Needed NASA Reports	13.5	12
Physical (Storage) Space	**61.3**	68
Other	9.9	18
Do Not Automatically Receive NASA Technical Reports	55.1	59

<u>Factors Influencing Use</u>. Survey participants were asked three questions about the use of NASA technical reports. In two questions, they were asked to give their opinions about the extent to which 10 factors influenced the use of NASA technical reports by (1) **technical management** and (2) **engineering or research personnel**. Influence was measured on a 1 to 5 point scale with "1" being the lowest possible influence and "5" being the highest possible influence of the factor. The third question asked survey participants (i.e., **information intermediaries**) to rate NASA technical reports on the same 10 factors. In questions one and two, the influence of accessibility, for example, was measured as "1" not influenced and "5" greatly influenced. In the third question, accessibility was measured as "1" not at all accessible and "5" very accessible. Their responses appear in (table 11).

In the case of **technical management**, survey participants think that their decision to use NASA technical reports is influenced by (1) relevance, (2) technical quality or reliability, (3) comprehensiveness, (4) familiarity or experience, (5) accessibility, and (6) timeliness. In the case of **engineering or research personnel**, survey participants think that their decision to use NASA technical reports is influenced by (1) relevance, (2) technical quality or reliability, (3) accessibility, (4) comprehensiveness, (5) familiarity or experience, and (6) timeliness.

Table 11. Factors Influencing Use of NASA Technical Reports

Factors	Overall Mean[a] (Number) Influence of Factors on Use By --		
	U.S. Technical Management	U.S. Engineering or Research Personnel	U.S.Aerospace Librarians and Technical Information Specialists
Accessibility	**3.5** (132)	**3.8** (136)	3.6 (142)
Ease of Use	3.2 (122)	3.5 (127)	**3.7** (120)
Expense	2.7 (127)	2.8 (128)	**3.8** (134)
Familiarity or Experience	**3.6** (133)	**3.7** (134)	**3.8** (133)
Technical Quality or Reliability	**3.7** (119)	**3.9** (125)	**4.0** (128)
Comprehensiveness	**3.6** (117)	**3.7** (123)	**3.8** (124)
Relevance	**3.8** (122)	**3.9** (127)	**3.9** (132)
Physical Proximity	3.2 (123)	3.3 (130)	3.6 (130)
Skill in Use	3.3 (121)	3.2 (127)	3.5 (128)
Timeliness	**3.5** (118)	**3.6** (119)	**3.7** (113)

[a] A 1 to 5 point scale was used to measure influence, with "1" being the lowest possible influence and "5" being the highest possible influence; hence, the higher the average (mean), the greater the influence of the factor.

As **information intermediaries**, survey participants rated NASA technical reports highest for (1) technical quality or reliability ($\bar{X}$ = 4.0) (i.e., the information was expected to be the best in terms of quality, accuracy, and reliability) followed by relevance ($\bar{X}$ = 3.9) (i.e., the expectation that a high percentage of the information retrieved would be used), expense ($\bar{X}$ = 3.8) (i.e., low cost in comparison to other information sources), familiarity or experience ($\bar{X}$ = 3.8) (i.e., prior knowledge or previous use), and comprehensiveness ($\bar{X}$ = 3.8) (i.e., the expectation the information source would provide broad coverage of the available knowledge).

Bibliographic (Print) Tools

Survey participants were asked a series of questions about the use (one or more times) in the past six months of selected bibliographic tools in their libraries. They were asked about the use and importance of selected print sources that were grouped in three categories -- (1) science-general, (2) engineering-general, and (3) aerospace. Their responses appear in (table 12).

__Use__. **Aerospace** print sources were used most, followed by **engineering-general** and **science-general**. Within aerospace, NASA *STAR* was used most (44.5%), followed by NTIS *GRA&I* (36.8%) and AIAA *IAA* (31.9%). *Applied Science and Technology Index and Engineering Index* were used about equally (34.1% and 31.3%). *Current Contents* was used to a far greater extent (22%) than *Science Citation Index* (9.9%).

__Importance__. Importance was measured on a 5 point scale with "1" being the lowest possible importance and "5" being the highest possible importance. NASA *STAR* was rated highest ($\bar{X}$ = 4.1) followed by NTIS *GRA&I* ($\bar{X}$ = 3.7), AIAA *IAA* ($\bar{X}$ = 3.6), and *Engineering Index* ($\bar{X}$ = 3.6). *Science Citation Index* had a low use rate (9.9%) but a high importance rating ($\bar{X}$ = 3.5).

Table 12. Use and Importance of Selected Announcement, Current Awareness, and Bibliographic Tools By U.S. Aerospace Industry Librarians -- Print Sources

Sources	Percent (Number) Using One or More Times In Past 6 Months	Average[a] (Mean) Importance Rating	Percent (Number) Do Not Have
Science - General			
Science Citation Index	9.9 (18)	3.5	62.6 (114)
Current Contents	22.0 (40)	3.2	52.2 (95)
Engineering - General			
Applied Science and Technology Index	34.1 (62)	3.4	37.9 (69)
Engineering Index	31.3 (57)	3.6	43.3 (79)
Aerospace			
Government Reports Announcement and Index (*GRA&I*)	36.8 (67)	3.7	37.9 (69)
International Aerospace Abstracts (*IAA*)	31.9 (58)	3.6	44.5 (81)
NASA *SCAN*	12.1 (22)	3.1	57.7 (105)
NASA SP-7037 (Aerospace Engineering: A Continuing Bibliography)	15.9 (29)	2.5	44.0 (80)
NASA *STAR*	44.5 (81)	4.1	28.0 (51)

[a] A 1 to 5 point scale was used to measure importance, with "1" being the lowest possible importance and "5" being the highest possible importance; hence, the higher the average (mean), the greater the importance of the product.

Electronic Data Bases

Survey participants were asked a series of questions about the use (one or more times) in the past six months of selected electronic data bases in their libraries. They were asked about the use and importance of selected electronic data bases that were grouped in four categories -- (1) general, (2) science-general, and (3) engineering-general, and (4) aerospace. Their responses appear in table 13.

Use. Overall, electronic data bases were used more frequently than the bibliographic (print) tools. Aerospace data bases were used most, followed by engineering-general, science-general and general data bases. Within aerospace, NTIS *Online* was used by most, (84.6%) followed by AIAA *Aerospace Data Base* by (77.5%), DTIC *DROLS* by (75.3%), and NASA *RECON* by (65.9%). *COMPENDEX* and *INSPEC* were used about equally (79.1% and 76.4%). *SCISEARCH* was used by 70.9% and *Wilson Line Index* by (63.2%).

Table 13. Use and Importance of Selected Announcement, Current Awareness, and Bibliographic Tools By U.S. Aerospace Industry Librarians -- Electronic Data Bases

Sources	Percent (Number) Using One or More Times In Past 6 Months	Average[a] (Mean) Importance Rating	Percent (Number) Do Not Have
General			
Wilson Line Index	63.2 (115)	2.5	58.2 (106)
Engineering - General			
COMPENDEX	79.1 (144)	4.3	20.3 (37)
INSPEC	76.4 (139)	4.0	17.6 (32)
Science			
SCISEARCH	70.9 (129)	3.3	22.0 (40)
Aerospace			
AIAA *Aerospace Data Base*	77.5 (141)	4.0	20.9 (38)
DTIC *DROLS*	75.3 (137)	4.2	42.9 (78)
NASA *RECON*	65.9 (120)	3.8	40.7 (74)
NTIS *Online*	84.6 (154)	4.3	17.0 (31)

[a] A 1 to 5 point scale was used to measure importance, with "1" being the lowest possible importance and "5" being the highest possible importance; hence, the higher the average (mean), the greater the importance of the product.

Importance. Importance was measured on a 1 to 5 point scale with "1" being the lowest possible importance and "5" being the highest possible importance. *COMPENDEX* and *INSPEC* were rated most important ($\bar{X}$ =4.3) ($\bar{X}$ = 4.0). Within the aerospace data bases, NTIS *Online* was rated most important ($\bar{X}$ = 4.3) followed by DTIC *DROLS* ($\bar{X}$= 4.2) and the AIAA *Aerospace Data Base* ($\bar{X}$ = 4.0). *Wilson Line Index* was rated least important ($\bar{X}$ = 2.5).

Cost Approach. Survey participants were asked which **COST** approach was used for providing searching of (online) electronic data bases (table 14). About 42% of the respondents indicated that the "user **pays** nothing for service; library absorbs **all** costs." About 42% indicated that the user pays either a **reduced** cost (19.1%) or **all** costs (22.5%) associated with searching electronic (online) data bases.

Table 14. Approaches Used By U.S. Aerospace Industry Librarians for Providing Searching of (Online) Electronic Data Bases

Approach	Percentage	Number
Not Offered	6.4	11
User Pays Nothing For Service; Library Absorbs **All** Costs	42.2	73
User Pays **Reduced** Cost; Library Absorbs **Some** of the Costs	19.1	33
User Pays **All** Costs	22.5	39
User Pays All Direct Costs Plus a Fee	2.3	4
Other	7.5	13

Search Approach. Survey participants were asked which approach was used in performing searches of electronic (online) data bases (table 15). About 62% of the intermediary respondents indicated they did **all** searches and about 15% indicated that they did **most** of the searches. Less than 5 percent of the respondents indicated that the user did **all** or **most** of the searches of electronic (online) data bases.

Computer and Information Technology

Survey participants were asked to indicate their use of computer and information technology. From a list of 14 information technologies, survey participants were asked to indicate if (1) they already use the technology, (2) don't use the technology but may in the future, and (3) don't use the technology and doubt if they will. The list was composed of established, new, and emerging technologies. The participants' responses appear in table 16.

The percentage of "I already use it" responses ranged from a high of 90.6% and 90.5% (electronic data bases and micrographics/microforms) to a low of 15.3% (video conferencing). A list, in descending order, follows for the information technologies most frequently used.

Table 15. Approaches Used By U.S. Aerospace Industry Librarians in Performing Searching of (Online) Electronic Data Bases

Approach	Percentage	Number
Not Offered	7.0	12
Users Do **All** Searches	1.2	2
Users Do **Most** Searches	3.5	6
Users Do **Half** of the Searches By Themselves and **Half** Through an Intermediary	3.5	6
Users Do **Most** Searches Through an Intermediary	15.1	26
Users Do **All** Searches Through an Intermediary	61.6	106
Other	8.1	14

Table 16. Use of Computer and Information Technology by U.S. Aerospace Industry Librarians

Information Technology	Percentage (Number) Responding			Total Respondents
	I Already Use It	I Don't Use It, But May In The Future	I Don't Use It And Doubt I Will	
Audiotapes and Cassettes	61.0 (105)	14.0 (24)	25.0 (43)	172
Motion Picture Film	23.5 (39)	10.8 (18)	65.7 (109)	166
Videotape	66.9 (113)	21.3 (36)	11.8 (20)	169
Desktop-Electronic Publishing	32.1 (52)	48.8 (79)	19.1 (31)	162
Computer Cassette-Cartridge Tapes	35.1 (54)	35.7 (55)	29.2 (45)	154
Electronic Mail	65.5 (110)	31.5 (53)	3.0 (5)	168
Electronic Bulletin Boards	38.6 (64)	48.8 (81)	12.7 (21)	166
Fax or Telex	89.6 (155)	8.7 (15)	1.7 (3)	173
Electronic Data Bases	90.6 (155)	7.6 (13)	1.8 (3)	171
Videoconferencing	15.3 (25)	39.3 (64)	45.4 (74)	163
Teleconferencing	30.1 (50)	36.7 (61)	33.1 (55)	166
Micrographics and Microforms	90.5 (152)	3.6 (6)	6.0 (10)	168
Laser Disk, Videodisk, or CD-ROM	53.0 (88)	41.0 (68)	6.0 (10)	166
Electronic Networks	54.8 (91)	39.2 (65)	6.0 (10)	166

Information Technologies Most Frequently Used

• Electronic data bases	90.6%
• Micrographics/microforms	90.5%
• Fax or telex	89.6%
• Videotape	66.9%
• Electronic mail	65.5%

A list, in descending order, follows of the information technologies that are not currently being used but "may be used in the future."

Information Technologies That May Be Used in the Future

• Electronic bulletin boards	48.8%
• Desktop-electronic publishing	48.8%
• Laser disk, videodisk, or CD-ROM	41.0%
• Videoconferencing	39.3%
• Electronic networks	39.2%

A list, in descending order, follows of the information technologies that are not currently being used and probably will "not be used in the future."

Information Technologies That Probably Will Not Be Used in the Future

• Motion picture film	65.7%
• Videoconferencing	45.4%
• Teleconferencing	33.1%
• Computer cassette-cartridge tapes	29.2%
• Audiotapes and cassettes	25.0%

NASA Information Products and Services

Survey participants were asked to evaluate selected NASA information products and services. They were asked to indicate the extent to which they agree with statements designed to assess each product or service according to specific characteristics. Agreement was measured on a 1 to 5 point scale with "5" being the highest possible agreement and "1" being the lowest possible agreement. The responses appear in table 17.

Overall assessments were highest for *IAA*, followed by *SCAN*, *STAR*, and *RECON*. Survey participants agreed that abstracts in NASA *STAR* are adequate (77.6%) and that the coverage in

Table 17. Perceptions of U.S. Aerospace Industry Librarians Concerning Selected NASA Information Products

NASA Information Products	Percentage*	Number
About NASA *STAR*:		
Coverage Is Adequate	77.0	90
Category Scheme Is Adequate	71.9	82
Announcements Are Current	63.5	73
Abstracts Are Adequate	77.6	90
About AIAA *IAA*:		
Coverage Is Adequate	84.2	64
Category Scheme Is Adequate	81.1	60
Announcements Are Current	72.4	55
Abstracts Are Adequate	79.5	62
About NASA *SCAN*:		
Announcements In *SCAN* Are Current Enough	75.0	30
SCAN Is Easy To Use	72.5	29
SCAN Is Timely	75.0	30
Print Quality Is Adequate	67.5	27
About NASA *RECON*:		
Coverage Is Adequate	82.8	53
RECON Is Easy To Use	39.4	26
RECON Data Base Is Current	69.3	43
Searches On *RECON* Meet User's Research Requirements	63.5	40
Searches On *RECON* Are Sufficient Compared With Searches of Other Data Bases	52.4	32

* The percentages report combined "1" and "2" responses on a 5-point scale with "1" being the strongest possible agreement.

NASA *STAR* is adequate (77.0%). Survey participants agreed that the coverage of *IAA* is adequate (84.2%) and that the category scheme for *IAA* is adequate (81.1%). For *SCAN*, survey participants agreed that it is timely (75.0%) and that the announcements in *SCAN* are current enough (75.0%). The ratings for NASA *RECON* were mixed. Survey participants agreed that the coverage is adequate (82.8%) and that the data base is current (69.3%). On the other hand, only 39.4% of the survey participants indicated that NASA *RECON* is easy to use. Slightly more than half (52.4%) of the respondents indicated that *RECON* searches are sufficient when compared to searches of other data bases.

Survey participants were asked to indicate how likely they would be to use selected aerospace information in electronic format (table 18). Likely use was measured on a 1 to 5 point

Table 18. Likely Use of Selected Aerospace Information in Electronic Format by U.S. Aerospace Industry Librarians

Item	Percentage*	Number
AIAA *IAA* on CD-ROM	34.9	44
NASA *STAR* on CD-ROM	46.5	65
Full Text of NASA Reports on CD-ROM	47.9	68
Computer Program Listings on CD-ROM	24.6	31
Numerical/Factual Data on CD-ROM	35.2	45
Numerical/Factual Data Online	40.0	50
Images (Photographs) on CD-ROM	32.4	42
NASA *RECON* Front-End	29.0	22
Online System (Full Text and Graphics) for NASA Technical Reports	59.7	83

* The percentages report combined "1" and "2" responses on a 5-point scale with "1" being the "most likely" to use and "5" being "not at all likely" to use.

scale with "5" being the "most likely" to use and "1" being the "least likely" to use. Overall, the willingness of industry-affiliated information intermediaries to use selected aerospace information in electronic format was not high. The highest "willingness to use" was recorded for an online system (full text and graphics) for NASA technical reports (59.7%). The lowest "willingness to use" was recorded for computer program listings on CD-ROM (24.6%). Overall "willingness to use" selected aerospace information on CD-ROM products was less than compelling.

The End-User-Intermediary Interface

Information intermediaries (i.e., librarians and technical information specialists) representing the end-user have been described as gatekeepers. The more active, the more effective the intermediary is in completing the STI production, transfer, and use process. Survey participants were asked a number of questions to learn more about their role as gatekeepers and to determine some measure of their effectiveness in completing the STI production, transfer, and use process.

Outreach. Survey participants were asked to identify the kinds of outreach programs offered by their libraries. The number of outreach activities offered could be used to gauge the "pro-activity" of aerospace industry information intermediaries. The responses appear in table 19.

The responses indicate that a relatively small number of U.S. aerospace industry libraries provide outreach programs for U.S. industry-affiliated aerospace engineers and scientists. Library skills instruction (25.2%), end-user searching instructions (17.8%), and engineering information resources and materials instruction (17.1%) are offered most frequently.

Table 19. Outreach Programs Provided By U.S. Aerospace Industry Libraries

Programs	Percentage (Number) Providing One or More Times In Past 6 Months	Do Not Provide
Tour Of Library	13.1 (6.0)	20
Library Presentation As Part Of Employee Orientation	8.4 (2.0)	54
Library Skills Instruction	25.2 (6.0)	32
Library Presentation For Members Of A Research Project/Team	3.2 (1.0)	53
Engineering Information Resources And Materials Instruction	17.1 (3.0)	45
Instruction For End-Users Searchers	17.8 (2.0)	57
Other	2.1 (0.0)	---

User Needs. Exploring the end-user-intermediary interface, survey participants were asked how they learned of user needs. Survey participants were asked to select from a list of activities those that they used as part of their library program. Their responses appear in table 20.

Table 20. How U.S. Aerospace Industry Librarians Learn About User Needs

Item	Percentage	Number
Requests Received	99.4	171
In-house Publications	44.8	69
Survey Questionnaires	33.1	51
One-on-One Interviews	89.7	148
Library Staff Meetings With Research/ Program Managers	40.7	61
Other	80.0	8

Almost all of the participants (99.4%) indicated that they learned about the needs of the users from the requests that the users submitted. About 90% utilized one-on-one interviews (presumably when the user comes to the library) to determine user needs. Those activities that would most likely be initiated by the information intermediary were used least. For example, surveys (33.1%), in-house publications such as library bulletins (44.8%), and library staff meetings with research/program managers (40.7%) were used by less than half of the survey participants.

Services Provided. Industry intermediaries were asked to identify the services that they provide to U.S. industry-affiliated aerospace engineers and scientists (table 21). Most of the U.S.

Table 21. Services Provided By U.S. Aerospace Industry Libraries

Service	Percentage	Number
Alerting Service	64.9	109
Electronic Ordering	61.0	100
Document Order and Delivery	93.1	161
Electronic Reference Services	78.1	132
Handouts and Library Guides	81.5	137
In-house SDI and Routing Services	57.7	94
End-user Online Data Base Search Training	21.0	34
NASA *SCAN*	24.8	40
Stored Search on NASA *RECON* for SDI	10.1	15
Other	3.8	7
Time Saving Assistance In		
Locating Sources	97.1	166
Identifying Documents	97.1	166
Acquiring Information	97.7	166
Expert Help In Learning/Using Information	72.6	114
Data Base Development	30.7	51
Uploading/Downloading	32.9	53
Remote Online Access To Library Catalog	47.6	78
CD-ROM Workstation(s) In Library	44.7	72
Cooperative Cost Sharing Services		
Group Contract For Online Services	32.1	50
Coordinated Access To Networks	32.1	51
Other	0.5	1
Acquisition Of Most-Used Data Bases For Searching Online Through Corporate Computer Facilities		
AIAA *Aerospace Data Base*	33.6	51
NTIS *Online*	38.6	59
NTIS *Federal Research In Progress (FEDRIP)*	13.4	19
DOE *Energy Data Base*	21.0	30
DTIC *DROLS*	21.7	33
NASA *RECON*	19.3	28
Other	7.1	13
Acquisition Or Development Of User-Friendly Front-End Systems For Searching Most-Used Online Data Bases		
Library Online Catalog Searching	51.2	84
Gateway Searching of Multiple Data Bases	19.0	30
Other	2.7	5
Other Innovative Services	6.6	12

aerospace industry libraries offered what might be thought of as the traditional services such as document order and delivery (93.1%), assistance in locating sources (97.1%), identifying documents (97.1%), and acquiring information (97.7%). On the other hand, very few of the aerospace industry libraries offered or participated in what might be thought of as the non-traditional services.

Sources of Competition. Survey participants were asked to identify those factors they considered to be sources of competition, those factors that might serve lessen the influence or the ability of the library to service the user population (table 22).

Survey participants identified the "old boy" network (55.3%), personal collections (65.8%), and department or project libraries (not a part of their library) (50.6%) as competition. Direct user access to outside information was not widely viewed as competition. Likewise, user access to computer and information technology was not widely viewed as competition.

Self-Assessment. Aerospace industry intermediaries were asked to perform a self-assessment according to four major criteria: funding, staffing, services to users, and interaction with users (table 23). A 5 point scale was used with "1" being excellent and "5" being poor.

Funding. With the exception of funding for online searching, survey participants recorded relatively low marks for funding. Funding for CD-ROM products (32.0%) and materials and equipment (37.1%) were lowest followed by funds for salaries and innovation (39.7%).

Staffing. Twenty-five percent of the respondents indicated that the size of their staff was excellent. Likewise, about 31 and 34%, respectively, indicated that the aerospace experience and science background of their staffs were excellent.

Services to Users. About 87% of the respondents thought they did an excellent job of supplying requested information. About 62% indicated they did an excellent job of alerting users and about 62% thought that the turn around (the time it takes to fill a request for information) was excellent.

Interaction With Users. Less than 50 percent of the respondents indicated that their interaction with users was excellent. About 47% surveyed users to determine their present and future information needs. Forty-eight percent thought they did an excellent job with user orientation and instruction. About one-third (33.5%) indicated they did an excellent job of attending user (e.g., departmental and project) meetings.

Table 22. Factors Considered By U.S. Aerospace Industry Librarians to be Competition in Providing Services to Users

Competition	Percentage	Number
The "Old Boy" Network	55.3	88
Personal Collections	65.8	106
Other Units Within The Organization		
Research Assistants Attached To Projects	21.8	34
Department or Project "Libraries" Not A Part Of Your Library	50.6	81
Other	0.5	1
Direct User Access To Outside Information Sources		
Information Brokers	24.8	38
Publishers	20.9	32
Online Vendors	20.4	31
NASA/CASI	9.9	15
NTIS	11.7	17
Other	2.2	4
Direct Use of National Computer Communications Networks		
ARPANET	3.3	5
INTERNET/NSFNET	4.0	6
Other	1.1	2
Direct Use of Regional Computer Communications Networks	2.7	5
Direct Use Of Facility Network (Local Area Network)		
Online Access TO Your Library Catalog	15.1	23
Online Access To Other Facility Libraries	13.8	21
Other	0.5	1
Transmission Of Text		
Office Facsimile Transmission	21.5	32
Electronic Mail	16.7	25
Manuscript Preparation And Delivery (Electronic Publishing)	8.8	13
Data Base Creation By Users		
Information Collection, Storage, And Use	25.3	37
Downloading Data To Personal Files	21.1	31
Electronic Transmission Of Data	17.4	25

Table 23. Self-Assessment of U.S. Aerospace Libraries

Factors	Percentage*	Number	No Opinion
Funding			
Staff Salaries	39.4	65	17
Materials/Equipment	37.1	62	15
Searching Online	66.4	109	18
CD-ROM	32.0	39	60
Innovation	39.7	64	21
Other	10.0	1	172
Staffing			
Staff Size	25.0	42	14
Aerospace Experience	30.5	47	28
Science Background	33.7	52	28
Services To Users			
Information Supplied On Request	86.9	146	14
Alerting	61.6	93	31
Turnaround Time	62.4	101	20
State-Of-The-Art	42.9	66	28
Interaction With Users			
User Needs Surveyed	46.6	70	32
User Meetings Attended	33.5	47	42
Orientation/Instruction	48.0	71	34

* The percentages report combined "1" and "2" responses on a 5-point scale with "1" being excellent and "5" being poor.

Reasons for Library Non-Use. Survey participants were asked their opinions as to why U.S. industry-affiliated aerospace engineers and scientists do not use their libraries (table 24). About 70% of the respondents stated that users were not aware of the services offered by the library. Likewise, 69.1% of the respondents indicated that the reason industry-affiliated aerospace engineers and scientists do not use the library is because they have personal collections of information.

To a lesser extent, survey participants selected reasons such as the "physical distance of the library" (from the user) (48.3%) and "library does not have the needed information" (40.5%). The least selected reasons were users "have to pay to use the library" (6.8%) and "management discourages use of the library (13.0%).

Table 24. Reasons Given By U.S. Aerospace Libraries For Library "Non-Use"

Reason	Percentage	Number	Not Answered
Not Aware Of Library's Existence	40.1	59	35
Not Aware Of The Services Offered By Library	69.5	107	28
Library's Hours Not Convenient	17.0	25	35
Library Physically Too Far Away	48.3	73	31
Information Needs Met More Easily Elsewhere	38.1	56	35
Library Does Not Have Information Needed	40.5	60	34
Library Too Slow In Getting Needed Information	31.5	47	33
Have To Pay To Use Library	6.8	10	36
Management Discourages Use Of Library	13.0	19	36
Own Personal Collection Of Information	69.1	105	30
Other	3.8	7	175

Proactivity. As information intermediaries, survey participants were asked two questions. They were asked to rate their knowledge of the technical information needs of the engineering and/or research staff in their respective organizations (table 25a) and to rate how active they are in transferring NASA-produced knowledge to the engineering and/or research staff in their respective organizations (table 25b).

About 56% stated that they had an extensive knowledge of the technical information needs of the engineering and/or research staff in their respective organizations. On the other hand, about 34% indicated that they are "very active" in transferring NASA produced knowledge to the engineering and/or research staff in their respective organizations.

Table 25a. U.S. Aerospace Industry Librarians as "Active" Information Intermediaries -- Self Assessment

Item	Percentage*	Number	Don't Know
Knowledge of Technical Information Needs of Engineering/Research Staff	56.2	87	8

* The percentage report combined "1" and "2" responses on a 5-point scale with "1" being extensive and "5" being none.

Table 25b. U.S. Aerospace Industry Librarians as "Active" Information Intermediaries -- Self Assessment

Item	Percentage*	Number	Don't Know
Role in Transferring NASA-Produced Knowledge to Engineering and/or Research Staff	33.6	50	14

* The percentage report combined "1" and "2" responses on a 5-point scale with "1" being very active and "5" being very passive.

Survey participants were asked to identify the actions taken to "actively transfer" NASA-produced knowledge to the engineering and/or research staff in their respective organizations (table 26). About one-third stated that they screened NASA-produced knowledge and 10% indicated they interpreted NASA-produced knowledge to the engineering and/or research staff in their respective organizations.

About 52% stated they could cite specific cases where NASA-produced knowledge provided by the library made a difference to an R&D project in their respective organizations. Fifty percent of the survey participants stated that they could identify barriers that hinder or keep them from "actively" transferring NASA-produced knowledge to the engineering and/or research staff in their respective organizations.

Table 26. U.S. Aerospace Industry Librarians As "Active" Information Transfer Agents of NASA-Produced Knowledge

Item	Percentage	Number
Actions Taken To Actively Transfer NASA-Produced Knowledge		
Screening Information	31.9	58
Interpreting Data	10.4	19
Other	15.4	28
Specific Cases Where NASA-Produced Knowledge Provided By Library Made A Difference To R&D Project	52.4	86
Barriers That Hinder "Active" Transfer Of NASA-Produced Knowledge	50.0	91

The Producer-Intermediary Interface

Survey participants were asked a series of questions designed to illuminate the interface between U.S. aerospace industry librarians and technical information specialists as information intermediaries and NASA as a producer of aerospace knowledge. From their position as information intermediaries, survey participants were asked to rate NASA's knowledge of the technical information needs of their respective engineering and/or research staffs (table 27a). About 52% of the survey respondents think that NASA has an excellent understanding the of technical information needs of their respective engineering and/or research staffs.

Table 27a. NASA's Knowledge of Engineering and/or Research Staff Technical Information Needs -- Librarians' Perceptions

Item	Percentage*	Number	Don't Know
Knowledge of Technical Information Needs of Engineering/Research Staff	56.2	87	8

* The percentage report combined "1" and "2" responses on a 5-point scale with "1" being extensive and "5" being none.

As information intermediaries, survey participants were asked to rate the amount of effort devoted by NASA to understanding the technical information needs of "your user community?" Their responses appear in table 27b. Slightly more than 50 percent of the respondents indicated that NASA devotes extensive effort to understanding the technical information needs of their respective user communities.

Table 27b. Effort Devoted by NASA To Understanding the Technical Information Needs of Engineering and/or Research Staff -- Librarians' Perceptions

Item	Percentage*	Number	Don't Know
Effort Devoted to Understanding Engineering and/or Research Staff Technical Information Needs	51.3	59	49

* The percentage report combined "1" and "2" responses on a 5-point scale with "1" being extensive and "5" being none.

As an information intermediary, each respondent was asked to rate the amount of effort devoted by NASA to involving U.S. industry information intermediaries in transferring the results

of NASA research to their respective user communities (table 27c.) Forty percent of the respondents indicated that NASA devoted extensive effort to involving U.S. industry librarians and technical information specialists in transferring the results of NASA research to their respective user communities.

Table 27c. Effort Devoted by NASA to Involving U.S. Aerospace Industry Librarians Results of NASA Research -- Librarians' Perceptions

Item	Percentage*	Number	Don't Know
Effort Devoted to Involving U.S. Aerospace Industry Librarians in Transferring Results of NASA Research	40.0	50	41

* The percentage report combined "1" and "2" responses on a 5-point scale with "1" being extensive and "5" being none.

To further explore the producer-intermediary interface, survey participants were asked, in the performance of their professional duties how many times in the past year they had contacted or had been contacted by NASA personnel about transferring the results of NASA-produced research (table 28). The responses indicate far more contact occurs between U.S. aerospace industry librarians and technical information specialists and NASA than between NASA personnel and U.S. aerospace industry librarians and technical information specialists.

Table 28. Communication Between U.S. Aerospace Industry Librarians and NASA

Item	Mean (Median) Number of Contacts In Past Year
You Contacted NASA	3.0 (0.0)
NASA Contacted You	0.5 (0.0)

Survey participants were asked if NASA should sponsor a NASA technical information users meeting similar to those held by the Defense Technical Information Center (DTIC) and the National Technical Information Service (NTIS) (table 29). Those who responded in the affirmative were asked their preference as to when the meeting should be held (table 29). About 87% of the respondents indicated that such a meeting is needed. Fifty percent of the respondents indicated that the NASA-sponsored technical information users meeting should be held on a regional basis. Twenty-one percent of the respondents indicated that the annual meeting should be held in Washington, DC, and about 21% indicated that the NASA-sponsored technical

information users meeting should be held in conjunction with some other annual national meeting.

Table 29. Opinions of U.S. Aerospace Industry Librarians Concerning a NASA-Sponsored Technical Information Users Meeting

Item	Percentage	Number
Need For Meeting		
Yes	86.8	112
No	13.2	17
Form Of Meeting		
Annual Meeting Held In Washington, DC	21.4	24
Annual Meeting On A Regional Basis	50.0	56
Annual Meeting In Conjunction With Some Other Annual National Meeting	20.5	23
Other	8.1	9

FINDINGS

Readers should note that the data reported in this report reflect responses of U.S. aerospace industry librarians and technical information specialists obtained from a list of libraries compiled from two sources. There is no way of determining the completeness of the list; hence, there is no way to accurately determine the extent to which the 182 (library) responses represent the true population of U.S. aerospace industry libraries. Further, the survey was conducted in May-August 1990, almost four years ago. The U.S. aerospace industry and aerospace industry libraries have undergone significant changes in the years since the survey was undertaken. Finally, the findings, and the data upon which the findings are based, are not generalizable to (1) aerospace industry libraries outside of the U.S. and (2) to U.S. academic engineering or aerospace engineering libraries.

1. The "average" U.S. aerospace industry librarian is a female, has about 17 years of library/information experience, has about 9 years of professional work experience in her present position, holds an MLS, belongs to a professional national library/information society, and is not a manager.

2. The "average" U.S. aerospace industry library is the sole or only library in the organization (company), has about seven professional staff members (although that figure has probably decreased since 1990), serves less than half of the potential user population, and operates as a cost center.

3. About 81% of the libraries surveyed had technical report collections composed primarily of NASA, DoD, and AGARD technical reports. For the most part, these reports were held in paper format rather than microfiche.

4. Less than one-third of the libraries surveyed held collections of foreign technical reports.

5. U.S. aerospace industry libraries receive NASA technical reports from multiple sources; NTIS and DTIC were used more often than NASA CASI as a source for obtaining NASA technical reports.

6. About 30% of the survey respondents indicated that NASA technical reports were heavily used; about 8% indicated that NACA technical reports were heavily used.

7. Survey participants gave the following three reasons why they would discontinue receiving NASA technical reports: cost, relevance (usefulness) of the reports, and lack of physical storage space.

8. Survey participants indicated their belief that the use of NASA technical reports by **technical managers** is influenced by **relevance** followed by **technical quality or reliability** and **comprehensiveness**.

9. Survey participants indicated their belief that the use of NASA technical reports by **engineering and research personnel** is influenced by **relevance** and **technical quality or reliability** and **accessibility**.

10. U.S. aerospace industry librarians and technical information specialists rated NASA technical reports highest for **technical quality or reliability** and **relevance**.

11. Selected announcement, current awareness, and bibliographic tools in electronic format were used more than those same tools in paper format; the same tools in electronic format were given a higher importance rating than were their paper format counterparts.

12. About 42% of the survey respondents indicated that the library absorbed all costs associated with the searching of (online) electronic data bases; about 19% indicated that the user paid a reduced cost and that the library absorbed some of the cost.

13. About 62% of the respondents indicated that the searching of (online) electronic data bases was done through an intermediary.

14. A majority of the survey respondents used what we defined as the "developing" information technologies; better than 40% indicated use of the "emerging" information technologies.

15. U.S. aerospace industry librarians and technical information specialists rated selected NASA information products high on all characteristics. The ease of using *RECON* was the notable exception.

16. About 60% of the survey respondents indicated a willingness to use an online system (with full text and graphics) for NASA technical reports.

17. The number of U.S. aerospace industry libraries offering outreach programs was low; U.S. aerospace industry librarians and technical information specialists learned about user needs through requests from users and one-on-one interviews with users.

18. Almost all of the U.S. aerospace industry libraries offered what we define as the traditional library services such as document order and delivery. Few, however, offered what we defined as innovative services.

19. Survey respondents considered the "old boy" network, personal collections, and libraries not part of the company's library to be competition in providing services to users.

20. As a self-assessment, the U.S. aerospace industry libraries gave themselves high marks for funding for online searching and providing services to users. They gave themselves low marks for overall funding, staffing size, and interaction with users.

21. Survey respondents listed a lack of user awareness of services offered and personal collections of information as the reasons why U.S. aerospace engineers and scientists do not use their company libraries.

22. As a self-assessment, about 56% of the survey respondents stated that they had an extensive knowledge of technical information needs of the engineering/research staff. On the other hand, about 34% indicated that they took an active role in transferring NASA-produced knowledge to the engineering/research staff.

23. About 52% of the survey respondents indicated that they could cite cases where NASA-produced knowledge, provided by the library, made a difference to the success of the R&D project. Fifty percent of the survey respondents indicated that they could cite specific barriers that hinder the "active" transfer of NASA-produced knowledge to the engineering/research staff.

24. About 56% of the survey respondents stated that NASA's knowledge of the technical information needs of their respective engineering/research staff was extensive. Furthermore, about 51% of the respondents indicated that NASA devoted extensive efforts to understanding the technical information needs of their respective engineering/research staffs.

25. Forty percent of the survey respondents indicated that the effort devoted by NASA to involving U.S. aerospace industry librarians and technical information specialists in transferring the results of NASA research was extensive.

26. The amount of communication between the U.S. aerospace industry libraries and NASA was far greater than the amount of communication between NASA and the U.S. aerospace industry libraries.

27. About 87% of the survey respondents indicated the need for a NASA-sponsored technical information users' meeting involving U.S. aerospace industry librarians. A simple majority of respondents indicated that the annual meeting should be held on a regional basis.

CONCLUDING REMARKS

The Phase 1 studies provided evidence to support the assumption that NASA technical reports are used by and are important to U.S. aerospace engineers and scientists. The results of the Phase 1 studies also support the assumption that the current "dissemination-based model" system used to transfer the results of federally funded aerospace R&D to the U.S. aerospace industry is passive. Much of the responsibility for completing the producer to user process falls to the end-user, that is, the U.S. aerospace engineer and scientist.

In large part, the results of the Phase 2 survey also support the two assumptions. NASA technical reports are used by and are important to U.S. aerospace engineers and scientists. The results also confirm the essentially passive nature of the system used to transfer the results of federally funded aerospace R&D. The findings also appear to confirm the essentially passive role of U.S. aerospace industry information intermediaries in the STI production, transfer, and use process. On the industry (user) side, the passive nature is due in large part to a lack of corporate support (funding). On the NASA (producer) side, the passive nature is due for the most part to the lack of effort devoted by NASA to involving U.S. aerospace industry information intermediaries in the producer to user process or to giving this group of individuals a specific role or responsibilities for completing the STI production, transfer, and use process.

U.S. aerospace industry librarians and technical information specialists do play an important role in completing the STI production, transfer, and use process. However, their impact does appear to be strongly conditional and limited to a specific context. Their role in completing the process could be enhanced by increasing their involvement (proactivity) and responsibility in the process. Increased involvement in the STI production, transfer, and use process requires greater recognition, responsibility, and support from U.S. aerospace industry management and NASA.

Phase 3 of the *NASA/DoD Aerospace Knowledge Diffusion Research Project* is concerned with the academic-government interface. As Phase 3 activities, we have surveyed academic aerospace information intermediaries, faculty, and students. In Report 22, we report the results of the Phase 3 U.S. academic aerospace information intermediary survey.

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APPENDIX A

NASA/DoD AEROSPACE KNOWLEDGE DIFFUSION RESEARCH PROJECT

Fact Sheet

The production, transfer, and use of scientific and technical information (STI) is an essential part of aerospace R&D. We define STI production, transfer, and use as *Aerospace Knowledge Diffusion*. Studies tell us that timely access to STI can increase productivity and innovation and help aerospace engineers and scientists maintain and improve their professional skills. These same studies remind us that we know little about aerospace knowledge diffusion or about how aerospace engineers and scientists find and use STI. To learn more about this process, we have organized a research project to study knowledge diffusion. Sponsored by NASA and the Department of Defense (DoD), the NASA/DoD Aerospace Knowledge Diffusion Research Project is being conducted by researchers at the NASA Langley Research Center, the Indiana University Center for Survey Research, and Rensselaer Polytechnic Institute. This research is endorsed by several aerospace professional societies including the AIAA, RAeS, and DGLR and has been sanctioned by the AGARD and AIAA Technical Information Panels.

This 4-phase project is providing descriptive and analytical data regarding the flow of STI at the individual, organizational, national, and international levels. It is examining both the channels used to communicate STI and the social system of the aerospace knowledge diffusion process. Phases 1 investigates the information-seeking habits and practices of U.S. aerospace engineers and scientists and places particular emphasis on their use of government funded aerospace STI. Phase 2 examines the industry-government interface and places special emphasis on the role of the information intermediary in the knowledge diffusion process. Phase 3 concerns the academic-government interface and places specific emphasis on the information intermediary-faculty-student interface. Phase 4 explores the information-seeking behavior of non-U.S. aerospace engineers and scientists from Brazil, Western Europe, India, Israel, Japan, and the Soviet Union.

The results will help us to understand the flow of STI at the individual, organizational, national, and international levels. The results of our research will contribute to increasing productivity and to improving and maintaining the professional competence of aerospace engineers and scientists. They can be used to identify and correct deficiencies, to improve access and use, to plan new aerospace STI systems, and should provide useful information to R&D managers, information managers, and others concerned with improving access to and utilization of STI. The results of our research are being shared freely with those who participate in the study. You can get copies of the project publications by contacting Dr. Pinelli.

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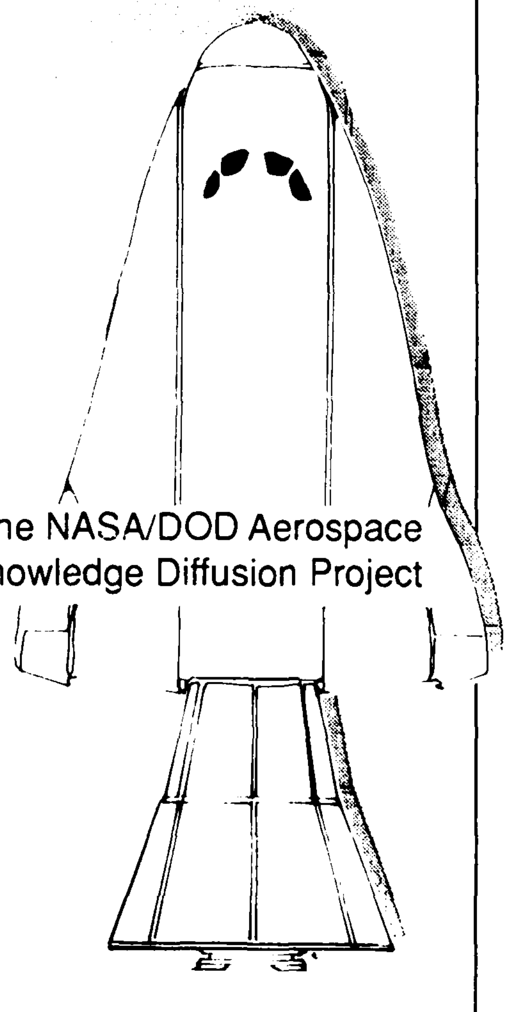
APPENDIX B

Phase 2 Industry Intermediary Questionnaire

Aerospace Librarians and Technical Information Specialists as Information Intermediates



Phase 2 of the NASA/DOD Aerospace Knowledge Diffusion Project

Sponsored by the
National Aeronautics and Space Administration
and the Department of Defense with the cooperation of Indiana University

These data will provide us with some background about your library.

1. Are there any other library/technical information centers at your facility? (Circle number)

YES	NO	
1	2	Please go to Q3

2. How many other libraries/technical information centers exist at your facility? (Please indicate)

   _______ other libraries/technical information centers

3. Please indicate the total size of the library staff in all libraries/technical information centers at your facility?

   Administrative/management .... ______
   Librarians/technical information specialists .... ______
   Library technicians .... ______
   Clerks .... ______
   Other (specify) ______________________ ______

4. Approximately how many potential library/technical information center **users** are there at your facility? (Please indicate)

   ________ ________ Don't Know (✓)

5. Approximately what percentage of the **potential users** actually use **your** library/technical information center? (Please indicate percentage)

   ________ % ________ Don't Know (✓)

6. Which of the following describes how your library/technical information center functions? These specific terms are derived from "The Library as a Profit Center," Stephen C. Tweed, *Special Libraries* 75:4 October 1984, 270-274. (Please circle **ONLY** one number)

   1. True Profit Center - Library is "...a profit-making segment...held accountable for financial performance just as any other division would be."

   2. Protected Profit Center - Library "...begins to sell services on a limited basis. The profits from outside sales are put back into the operating budget of the library."

   3. Cost Center - Library charged to the overhead of the organization.

   4. Self-Sufficient Cost Center - Library operates on a charge-back system and strives to recover all or part of its operating budget.

   5. Cost-Justified Center - Library operates on its own budget. "Requests for services are recorded and a dollar value is placed on them. Each year the library has an objective to achieve a set level of savings or value recognized."

   6. Other (specify) __________________________

These data will help us understand how your library deals with technical reports.

7. Does your library subscribe to, automatically receive, purchase, or otherwise obtain the following? (Circle numbers)

	YES	NO	Don't Know
NASA technical reports in paper	1	2	9
NASA technical reports in fiche	1	2	9
DOD technical reports in paper	1	2	9
DOD technical reports in fiche	1	2	9
FAA technical reports in paper	1	2	9
FAA technical reports in fiche	1	2	9
AGARD technical reports in paper	1	2	9
AGARD technical reports in fiche	1	2	9
U. S. aerospace company technical reports	1	2	9
U. S. university technical reports	1	2	9
AIAA papers in hard copy	1	2	9
AIAA papers in fiche	1	2	9

8. Does your library subscribe to, automatically receive, purchase, or otherwise obtain the following foreign (non-U. S.) technical reports? (Circle numbers)

	YES	NO	Don't Know
British ARC and RAE reports	1	2	9
ESA reports	1	2	9
French ONERA reports	1	2	9
German DFVLR, DLR, and MBB reports	1	2	9
Japanese NAL reports	1	2	9
Swedish NAL reports	1	2	9
Other (specify) ____________________			

9. Do the engineering or research department(s), division(s), or office(s), maintain a NASA technical report collection separate from that which is kept in **your** library? (Circle number)

   1 Yes
   2 No
   3 Don't know

10. Including in-house (company) reports, approximately how large is your library's/technical information center's technical report collection? (Please indicate)

   ______ total number of technical reports

11. Approximately what percentage of your total technical report collection is NASA/NACA technical reports? (Indicate percentage)

_______ %   _______ Don't Know (✓)

These data will help us understand the use of NASA technical reports in your library.

12. Which of the following **best** describes how **your** library routinely receives NASA technical reports? (Circle **ONLY** one number)

1 Directly from NASA
2 From NTIS
3 From GPO
4 Does not routinely receive NASA technical reports
5 Other (specify) ____________________

13. Which of the following **best** characterizes the use of the NACA technical reports in **your** library? (Circle number)

Heavily Used				Not Used At All	Don't Know	No NACA Technical Report Collection
1	2	3	4	5	7	9

14. Which of the following **best** characterizes the use of the NASA technical reports in **your** library? (Circle number)

Heavily Used				Not Used At All	Don't Know	No NASA Technical Report Collection
1	2	3	4	5	7	9 → Please go to Q19, p. 5

15. Which of the following are used to provide access to **your** NASA technical report collection? (Circle **ALL** that apply)

	YES	NO
Card catalog	1	2
Printed directories (e.g., NASA STAR)	1	2
OPAC (Online Public Access Catalog)	1	2
COMCAT (Computer Output Microfiche Catalog)	1	2
NASA RECON	1	2
Other (specify) ____________________		

16. How is bibliographic access provided to the NASA technical reports in your library? (Circle **ALL** that apply)

	YES	NO
Author	1	2
Title	1	2
Report number	1	2
Subject	1	2
Corporate source	1	2
Contract/grant number	1	2
Key words	1	2
Other (specify) ____________		

17. Which of the following describes how **physical access** to your NASA/NACA technical report collection is provided? (Circle **ALL** that apply)

NASA

	YES	NO
1 Open	1	2
2 Closed	1	2
3 Individually cataloged	1	2
4 Arranged by report numbers, by report series	1	2
5 Other (specify) ____________		

NACA

	YES	NO
1 Open	1	2
2 Closed	1	2
3 Individually cataloged	1	2
4 Arranged by report numbers, by report series	1	2
5 Other (specify) ____________		

18. Approximately how many times in the **past six months** has your library utilized the following sources to obtain NASA technical reports **not in your** collection?

	Times in the Past Six Months	Don't Know (✓)
NTIS	______	( )
NASA STIF	______	( )
DTIC	______	( )
NASA field center library	______	( )
NASA author	______	( )
Another library	______	( )
DDS or broker	______	( )
OCLC	______	( )
AIAA technical library	______	( )
Other (specify) ____________	______	

19. Approximately how many times in the **past six months** has a NASA technical report been requested by one of **your** patrons but *could not be obtained from your library* for each of the following reasons?

	Times in the Past Six Months	Don't Know (✓)
Your library did not own the report	________	( )
Your library owned the report but it was missing or could not be found	________	( )
The report was in a STAR category not received by your library	________	( )
The report was distributed in fiche only and your library receives paper copy in that STAR category	________	( )
The report was distributed in paper only and your library receives fiche copy in that STAR category	________	( )
The report was listed in STAR but was not automatically distributed by NASA	________	( )
The report was in a STAR category you automatically receive but you never received it	________	( )
The report was referenced as a NASA publication but was not in the NASA system	________	( )
The report was a classified, restricted, or limited distribution document	________	( )
The report was available **only from** the NASA center of origin	________	Specify NASA center(s) ________ ________
The report was available **only from** the author or technical monitor	________	( )
Insufficient bibliographic information; did not know where or how to obtain the report	________	( )
Other (specify ____________________	________	

20. Which of the following best characterizes why **your** library **would consider** *discontinuing* automatically receiving NASA technical reports? (Circle ALL that apply)

	YES	NO
Automatic distribution (subscription) is too costly	1	2
NASA technical reports duplicate other sources of needed information	1	2
The information contained in NASA technical reports is not timely	1	2
Not all the reports received were useful	1	2
Problems with the distribution and receipt of NASA reports	1	2
NASA contract/grant completed; no longer needed NASA reports	1	2
Physical (storage) space	1	2
Do not automatically receive NASA technical reports	1	2

Other (specify) ______________________________

21. To what extent do you think the following factors influence the use of the NASA technical reports in **your** library by the ***technical management*** personnel in your facility? (Circle numbers)

	Greatly Influenced				Not Influenced	Don't Know
ACCESSIBILITY: the ease of getting to the information source	1	2	3	4	5	9
EASE OF USE: the ease of comprehending or utilizing the information	1	2	3	4	5	9
EXPENSE: low cost in comparison to other information sources	1	2	3	4	5	9
FAMILIARITY OR EXPERIENCE: prior knowledge or previous use of the information source	1	2	3	4	5	9

FACTORS	Greatly Influenced				Not Influenced	Don't Know
TECHNICAL QUALITY OR RELIABILITY: the information was expected to be the best in terms of quality, accuracy, and reliability	1	2	3	4	5	9
COMPREHENSIVENESS: the expectation the information source would provide broad coverage of the available knowledge	1	2	3	4	5	9
RELEVANCE: the expectation that a high percentage of the information retrieved from the source would be used	1	2	3	4	5	9
PHYSICAL PROXIMITY: the distance to the information source	1	2	3	4	5	9
SKILL IN USE: the level of skill or skill mastery required to use the information source	1	2	3	4	5	9
TIMELINESS: the time allocated or available to produce a solution	1	2	3	4	5	9

22. To what extent do **you** think the following factors influence the use of the NASA technical reports in **your** library by **engineering or research** personnel in your facility? (Circle numbers)

	Greatly Influenced				Not Influenced	Don't Know
ACCESSIBILITY: the ease of getting to the information source	1	2	3	4	5	9
EASE OF USE: the ease of comprehending or utilizing the information	1	2	3	4	5	9
EXPENSE: low cost in comparison to other information sources	1	2	3	4	5	9
FAMILIARITY OR EXPERIENCE: prior knowledge or previous use of the information source	1	2	3	4	5	9
TECHNICAL QUALITY OR RELIABILITY: the information was expected to be the best in terms of quality, accuracy, and reliability	1	2	3	4	5	9
COMPREHENSIVENESS: the expectation the information source would provide broad coverage of the available knowledge	1	2	3	4	5	9

FACTORS	Greatly Influenced				Not Influenced	Don't Know
RELEVANCE: the expectation that a high percentage of the information retrieved from the source would be used	1	2	3	4	5	9
PHYSICAL PROXIMITY: the distance to the information source	1	2	3	4	5	9
SKILL IN USE: the level of skill or skill mastery required to use the information source	1	2	3	4	5	9
TIMELINESS: the time allocated or available to produce a solution	1	2	3	4	5	9

23. As an intermediary, how would you rate NASA technical reports on each of the following factors? (Circle numbers)

	Very				Not At all	Don't Know
ACCESSIBILITY: the ease of getting to the information source	1	2	3	4	5	9
	Easy				**Difficult**	**Don't Know**
EASE OF USE: the ease of comprehending or utilizing the information	1	2	3	4	5	9
	Not Expensive				**Very Expensive**	**Don't Know**
EXPENSE: low cost in comparison to other information sources	1	2	3	4	5	9
	Very Familiar				**Not at all Familiar**	**Don't Know**
FAMILIARITY OR EXPERIENCE: prior knowledge or previous use of the information source	1	2	3	4	5	9
	Excellent				**Poor**	**Don't Know**
TECHNICAL QUALITY OR RELIABILITY: the information was expected to be the best in terms of quality, accuracy and reliability	1	2	3	4	5	9

FACTORS						
	Excellent				Poor	Don't Know
COMPREHENSIVENESS: the expectation the information source would provide broad coverage of the available knowledge	1	2	3	4	5	9
	Highly				Not At all	Don't Know
RELEVANCE: the expectation that a high percentage of the information retrieved from the source would be used	1	2	3	4	5	9
	Close				Far	Don't Know
PHYSICAL PROXIMITY: the distance to the information source	1	2	3	4	5	9
	Easy				Difficult	Don't Know
SKILL IN USE: the level of skill or skill mastery required to use the information source	1	2	3	4	5	9
	Very				Not At all	Don't Know
TIMELINESS: the time allocated or available to produce a solution	1	2	3	4	5	9

These data will help us determine the use of the bibliographic tools and electronic databases by library personnel.

24. Approximately how many times in the **past six months** did the library staff use the following **print** sources?

PRINT SOURCES	Times in Past Six Months	Do Not Have (✓)
Applied Science and Technology Index	_______	( )
Engineering Index	_______	( )
Current Contents	_______	( )
Government Reports Announcement and Index	_______	( )
International Aerospace Abstracts	_______	( )
NASA SP-7037 (Aeronautical Engineering: A Continuing Bibliography With Indexes)	_______	( )
NASA SCAN	_______	( )

PRINT SOURCES	Times in Past Six Months	Do Not Have (✓)
NASA STAR	______	( )
Science Citation Index	______	( )
Other (specify) ____________	______	

25. Approximately how many times in the **past six months** did the library staff use the following **electronic sources**?

ONLINE (ELECTRONIC) DATABASES	Times in Past Six Months	Do Not Have (✓)
Aerospace Database	______	( )
COMPENDEX	______	( )
DTIC DROLS	______	( )
INSPEC	______	( )
NASA RECON	______	( )
NTIS Online	______	( )
Wilson Line Index	______	( )
SCISEARCH	______	( )
Other (specify) ____________	______	

26. How important to your library are the following **print** sources? (Circle numbers)

PRINT SOURCES	Very Important				Not at all Important	Do Not Have
Applied Science and Technology Index	1	2	3	4	5	9
Engineering Index	1	2	3	4	5	9
Current Contents	1	2	3	4	5	9
Government Report Announcement Index	1	2	3	4	5	9
International Aerospace Abstracts	1	2	3	4	5	9
NASA SP-7307 (Aeronautical Engineering: A Continuing Bibliography with Indexes)	1	2	3	4	5	9

PRINT SOURCES	Very Important				Not at all Important	Do Not Have
NASA SCAN	1	2	3	4	5	9
NASA STAR	1	2	3	4	5	9
Science Citation Index	1	2	3	4	5	9
Other (specify) ________	1	2	3	4	5	9

27. How important to your library are the following **electronic sources**? (Circle numbers)

ONLINE (ELECTRONIC) DATABASES	Very Important				Not at all Important	Do Not Have
Aerospace Database	1	2	3	4	5	9
COMPENDEX	1	2	3	4	5	9
DTIC DROLS	1	2	3	4	5	9
INSPEC	1	2	3	4	5	9
NASA RECON	1	2	3	4	5	9
NTIS Online	1	2	3	4	5	9
SCISEARCH	1	2	3	4	5	9
Wilson Line Index	1	2	3	4	5	9
Other (specify) ________	1	2	3	4	5	9

These data will help us determine the use of information technology in your library.

28. Which of the following **best** represents your library's approach to paying for online search services? (Circle **ONLY** one number)

1 Not offered

2 User pays **nothing** for service; library absorbs **all** costs

3 User pays **reduced** cost; library absorbs **some** of the costs

4 User pays **all** costs

5 User pays all direct costs plus a fee

6 Other (specify) ________

29. Which of the following **best** characterizes your library's approach to providing online (electronic) search services? (Circle **ONLY** one number)

1 Not offered

2 Users do **all** searches

3 Users do **most** searches

4 Users do **half** of the searches by themselves and **half** through an intermediary

5 Users do **most** searches through an intermediary

6 Users do **all** searches through an intermediary

7 Other (specify) ____________________________

30. Please state your library's philosophy or policy regarding end-user searching of electronic databases.

____
____
____
____
____

31. How do you view your library's use of the following electronic/information technologies? (Circle numbers)

Information Technologies	*We already use it*	*We don't use it, but may in the future*	*We don't use it and doubt if we will*
Audio tapes and cassettes	1	2	3
Motion picture film	1	2	3
Video tape	1	2	3
Desk top/electronic publishing	1	2	3
Computer cassette/cartridge tapes	1	2	3
Electronic Mail	1	2	3
Electronic bulletin boards	1	2	3
FAX or TELEX	1	2	3
Electronic databases	1	2	3
Video conferencing	1	2	3
Teleconferencing	1	2	3
Micrographics & microforms	1	2	3
Laser disc/video disc/CD-ROM	1	2	3
Electronic networks	1	2	3

These data will provide feedback regarding NASA information products and services.

32. Please indicate how strongly **YOU agree** or **disagree** with each of the following statements concerning the following bibliographic products. (Circle numbers)

About STAR	Strongly Agree				Strongly Disagree	Don't Know
The coverage is adequate	1	2	3	4	5	9
The category scheme is adequate	1	2	3	4	5	9
The announcements are current	1	2	3	4	5	9
The abstracts are adequate	1	2	3	4	5	9

About IAA	Strongly Agree				Strongly Disagree	Don't Know
The coverage is adequate	1	2	3	4	5	9
The category scheme is adequate	1	2	3	4	5	9
The announcements are current	1	2	3	4	5	9
The abstracts are adequate	1	2	3	4	5	9

About SCAN	Strongly Agree				Strongly Disagree	Don't Know
The announcements are current	1	2	3	4	5	9
SCAN is easy to use	1	2	3	4	5	9
SCAN is timely	1	2	3	4	5	9
The print quality is adequate	1	2	3	4	5	9

About RECON	Strongly Agree				Strongly Disagree	Don't Know
The coverage is adequate	1	2	3	4	5	9
RECON is easy to use	1	2	3	4	5	9
The RECON database is current	1	2	3	4	5	9
Searches on RECON meet user's research requirements	1	2	3	4	5	9
Searches on RECON are sufficient compared to searches of other databases	1	2	3	4	5	9

33. How likely would **YOU** be to use the following if they were provided in electronic format? (Circle numbers)

	Very Likely				Not at all Likely	Don't Know
IAA on CD-ROM	1	2	3	4	5	9
STAR on CD-ROM	1	2	3	4	5	9
Full text of NASA reports on CD-ROM	1	2	3	4	5	9
Computer program listings on CD-ROM	1	2	3	4	5	9
Numerical/factual data on CD-ROM	1	2	3	4	5	9
Numerical/factual data *online*	1	2	3	4	5	9
Images (photographs) on CD-ROM	1	2	3	4	5	9
RECON front-end	1	2	3	4	5	9
Online system (full text and graphics) for NASA technical reports	1	2	3	4	5	9

34. What barriers, if any, would hinder your library's adoption of the electronic information products listed in Question 33? (Please list)

1 ______________________________
2 ______________________________
3 ______________________________

35. What information products or services, if any, should NASA discontinue? (Please list)

1 ______________________________
2 ______________________________
3 ______________________________

36. What new information products or services, if any, should NASA consider offering? (Please list)

1 ______________________________
2 ______________________________
3 ______________________________

These data will help us understand the interface between librarians as information intermediaries and engineering and research personnel as information users.

37. Approximately how many times in the **past six months** has **your** library provided the following services for the engineering and/or research staff?

	Times in the Past Six Months	Don't Provide (✓)
Tour of the library	________	( )
Library presentation as part of employee orientation	________	( )
Library skills instruction	________	( )
Library presentation for members of a research project/team	________	( )
Engineering information resources and materials instruction	________	( )
Instruction for end-user searchers	________	( )
Other (specify) ________________	________	

38. How does your library generally learn about user needs? (Circle numbers)

	YES	NO
Requests received	1	2
In-house publications	1	2
Survey questionnaires	1	2
One-on-one interviews	1	2
Library staff meetings with research/program managers	1	2
Other (specify) ________________		

39. Which of the following services does YOUR library provide? (Circle numbers)

	YES	NO
Alerting services	1	2
Electronic ordering	1	2
Document order and delivery	1	2
Electronic reference services	1	2
Handouts & library guides	1	2
In-house SDI and routing services	1	2
End-user on-line database search training	1	2
NASA SCAN	1	2
Stored search on RECON for SDI	1	2
Other (specify) ________________		

40. Which of the following services does YOUR library provide? (Circle numbers)

	YES	NO
Time-saving assistance in		
Locating sources	1	2
Identifying documents	1	2
Acquiring information	1	2
Expert help in learning/using information	1	2
Database development	1	2
Uploading/downloading	1	2
Remote online access to library catalog	1	2
CD/ROM workstation(s) in library	1	2
Cooperative cost sharing services		
Group contract for online services	1	2
Coordinated access to networks	1	2
Other (specify)________________		
Acquisition of most-used databases for searching online through corporate computer facilities		
Aerospace Database	1	2
NTIS online	1	2
Federal Research in Progress (FEDRIP)	1	2
Energy Database	1	2
DTIC DROLS	1	2
NASA RECON	1	2
Other (specify)________________		
Acquisition or development of user-friendly front-end systems for searching most-used online databases		
Library online catalog searching	1	2
Gateway searching of multiple databases	1	2
Other (specify) ________________		
Other innovative services (specify) ________________		

41. Which of the following do you see as "competition" for your library in providing information services to the engineering and/or research staff? (Circle numbers)

	YES	NO
The "old boy" network	1	2
Personal collections	1	2

COMPETITION	YES	NO
Other units within the organization		
Research assistants attached to projects	1	2
Department or Project "libraries" not a part of your library	1	2
Other (specify)________________		
Direct user access to outside information sources		
Information brokers	1	2
Publishers	1	2
Online vendors	1	2
NASA/STIF	1	2
NTIS	1	2
Other (specify)________________		
Direct use of national computer communications networks		
APRANET	1	2
Internet/NSFNET	1	2
Other (specify)________________		
Direct use of regional computer communications networks		
(specify)________________		
________________		
Direct use of facility network (local area network)		
Online access to your library catalog	1	2
Online access to other facility libraries	1	2
Other (specify)________________		
Transmission of text		
Office facsimile transmission	1	2
Electronic Mail	1	2
Manuscript preparation and delivery (electronic publishing)	1	2
Database creation by users		
Information collection, storage, and use	1	2
Downloading data to personal files	1	2
Electronic transmission of data	1	2

42. Overall, how would you rate your library's information services? (Circle numbers)

	Excellent				Poor	No Opinion
Funding						
Staff salaries	1	2	3	4	5	9
Materials/equipment	1	2	3	4	5	9
Searching online	1	2	3	4	5	9
CD/ROM	1	2	3	4	5	9
Innovation	1	2	3	4	5	9
Other (specify) ________________	1	2	3	4	5	9

LIBRARY SERVICES

	Excellent				Poor	No Opinion
Staffing						
Staff size	1	2	3	4	5	9
Aerospace experience	1	2	3	4	5	9
Science background	1	2	3	4	5	9
Services to users						
Information supplied on request	1	2	3	4	5	9
Alerting	1	2	3	4	5	9
Turnaround time	1	2	3	4	5	9
State-of-the-art	1	2	3	4	5	9
Other (specify) ____________						
Interaction with users						
User needs surveyed	1	2	3	4	5	9
User meetings atte... d	1	2	3	4	5	9
Orientation/instruction	1	2	3	4	5	9

43. Which of the following statements explain why members of the engineering and/or research staff do not use your library? (Circle numbers)

	YES	NO
They are not aware of the library's existence	1	2
They are not aware of the services offered by the library	1	2
Library's hours not convenient	1	2
Library's physically too far away	1	2
Information needs met more easily elsewhere	1	2
Library does not have the information they need	1	2
Library too slow in getting needed information	1	2
They have to pay to use the library	1	2
Management discourages using of the library	1	2
They have their own personal collection of information	1	2
Other (specify) ____________		

44. As an intermediary, how would YOU rate your knowledge of the technical information needs of the engineering and/or research staff at your facility? (Circle number)

Extensive				None	Don't Know
1	2	3	4	5	9

45. As an intermediary, how active are you in transferring NASA produced knowledge to the engineering and/or research staff at your facility? (Circle number)

Very Active				Very Passive	Don't Know
1	2	3	4	5	9

46. As an intermediary, what steps or actions, if any, do you take to "actively" transfer NASA produced knowledge (technology transfer rather than information transfer) to the engineering and/or research staff at your facility? (Circle **ALL** that apply)

1 Screening information
2 Interpreting data
3 Other (specify) ____________________
4 Other (specify) ____________________

47. Within the past year, are you able to cite at least one specific case or incident that demonstrates how information provided (or denied) by your library made a difference to an R&D project? (Circle number)

YES	NO
1	2

48. Would you be willing to identify the user for a follow-up interview? (Circle number)

YES	NO
1	2

49. As an intermediary, what barriers, if any, hinder or keep you from "actively" transferring NASA produced knowledge (technology transfer rather than information transfer) to the engineering and/or research staff at your facility? (Please list)

1 ____
2 ____
3 ____
4 ____

50. In your company or corporation, do you think there are "gatekeepers," engineers and/or researchers who serve as information intermediaries for other engineers and researchers? (Circle number)

YES	NO
1	2

52. Would you be willing to furnish the names of these individuals for a follow-up study concerned with determining the role played by these "gatekeeper" in technology transfer? (Circle number)

YES	NO
1	2

These data will help us understand the interface between librarians as information intermediaries and NASA as a knowledge producer.

53. As an intermediary, how would you rate NASA's knowledge of the technical information needs of your user community? (Circle number)

Extensive				None	Don't Know
1	2	3	4	5	9

54. As an intermediary, how much effort does it appear that NASA devotes to understanding the technical information needs of your user community? (Circle number)

Extensive				None	Don't Know
1	2	3	4	5	9

55. As an intermediary, how much effort do you think NASA devotes to involving you in transferring the results of NASA research to your user community? (Circle number)

Extensive				None	Don't Know
1	2	3	4	5	9

56. As an intermediary, what steps or actions, if any, should NASA take to increase the participation or involvement of librarians in transferring the results of NASA research to the aerospace community? (Please list)

1 ______________________________
2 ______________________________
3 ______________________________
4 ______________________________

57. In performing your professional duties as an intermediary, about how many times, in this past year, have you contacted or been contacted by NASA personnel concerning transferring the results of NASA research?

	Times in PAST YEAR
YOU contacted NASA	________
NASA contacted YOU	________

Finally, we would like to collect some background information on the person to whom our letter was addressed. This information will be helpful with the analysis of the data.

58. Gender:

1 Female
2 Male

59. Years of library/information experience:

________ years of experience

60. Years in present position:

________ years in present position

61. Education:

1 B. A. in ________
2 B. S. in ________
3 MLS
4 Master's in ________
5 MBA
6 J. D.
7 Ph. D. in ________
8 Other (specify) ________

62. Title or position in library:

____

63. Professional (national) library/information membership (Circle ALL that apply)

1 ALA
2 ASEE
3 ASIS
4 SLA
5 Other national library or information society (specify) ________
6 Not a member of any national library or information society

64. Professional (national) technical membership (Circle **ALL** that apply)

1 ACM
2 AIAA
3 ASTM
5 IEEE
6 Other national technical society (specify) ________________
7 Not a member of any national technical society

OPTIONAL QUESTIONS

1. What suggestions can **YOU** offer for improving access to the results NASA produced knowledge?

____
____
____
____

2. Should NASA sponsor a NASA technical information users meeting similar to those held by DTIC and NTIS? (Circle number)

YES	NO
1	2

3. What form would you prefer the meeting take? (Circle number)

1 Annual meeting held in Washington, DC
2 Annual meeting held on a regional basis
3 Annual meeting held in conjunction with annual national meetings
4 Other (specify) ________________

4. What suggestions can you offer regarding the structure, purpose, content, and scope of a NASA technical information users meeting that would be attended by information intermediaries from academia, industry, and government?

____
____
____
____

5. Is there anything else YOU would care to say regarding this research?

____
____
____
____

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13. ABSTRACT *(Maximum 200 words)*

The U.S. government technical report is a primary means by which the results of federally funded research and development (R&D) are transferred to the U.S. aerospace industry. However, little is known about this information product in terms of its actual use, importance, and value in the transfer of federally funded R&D. To help establish a body of knowledge, the U.S. government technical report is being investigated as part of the *NASA/DoD Aerospace Knowledge Diffusion Research Project*. In this report, we summarize the literature on technical reports and provide a model that depicts the transfer of federally funded aerospace R&D via the U.S. government technical report. We present results from our investigation of aerospace knowledge diffusion vis-á-vis the U.S. government technical report, and present the results of research that investigated aerospace knowledge diffusion vis-á-vis U.S. aerospace industry librarians and technical information specialists as information intermediaries.

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